

CLAIMS

What is claimed is:

1. A system for directing a selected light beam to at least one light beam receptor, said system comprising:

3. an array of stationary optical fibers, each one of said stationary optical fibers constructed and arranged to conduct one of a plurality of light beams including the selected light beam; an array of movable reflective surfaces, each of said movable reflective surfaces being mounted on a thermal actuator;

7. whereby the application of electrical or heat energy to one of said thermal actuators will move said movable reflective surface mounted on said thermal actuator into the path of the selected light beam so that the selected light beam will be directed to 10 the light beam receptor.

1. 2. The system as defined in Claim 1, wherein the thermal actuator is 2 frictionless.

1. 3. The system as defined in Claim 1, wherein the thermal actuator has 2 a cantilever mounting.

1. 4. The system as defined in Claim 1, wherein the system is able to 2 select among beams of light by changing the thermal actuator to which electrical or heat 3 energy is directed.

1 5. The system as defined in Claim 1, wherein each one of the array of
2 stationary optical fibers includes a collimating lens for directing the light beam toward
3 said movable reflective surface.

1 6. The system as defined in Claim 1, wherein the selected light beam
2 is directed to a collimating lens on the receptor.

1 7. The system as defined in Claim 1, wherein said thermal actuator is
2 a silicon-based beam sandwiched between two layers of a material having a differing
3 coefficient of thermal expansion.

1 8. The system as defined in Claim 1, wherein said thermal actuator is
2 a silicon-based beam attached to a single layer of a material having a differing coefficient
3 of thermal expansion.

1 9. The system as defined in Claim 1, wherein said thermal actuator
2 includes a silicon wafer, a sacrificial layer, a material with a first coefficient of thermal
3 expansion, and a material with a second coefficient of thermal expansion.

1 10. A method for directing a selected light beam emanating from one
2 of a plurality of optical fibers to at least one light beam receptor, said method comprising
3 the steps of:

4 (a) mounting the plurality of optical fibers in a fixed array;
5 (b) mounting a plurality of movable reflective surfaces on individual
6 thermal actuators;
7 (c) energizing said thermal actuators to cause said movable reflective
8 surface to intersect the selected light beam emanating from one of the plurality of optical
9 fibers and direct said selected light beam to the light beam receptor.

1 11. The method as defined in Claim 10, wherein said thermal actuator
2 is frictionless.

1 12. The method as defined in Claim 10, wherein said thermal actuator
2 has a cantilever mounting.

1 13. The method as defined in Claim 10, wherein the thermal actuators
2 are bimorph composite beams.

1 14. The method as defined in Claim 10, wherein said thermal actuators
2 are silicon-based beams sandwiched between two layers of a material having a differing
3 coefficient of thermal expansion.

1 15. The method as defined in Claim 10, wherein said thermal actuators
2 are silicon-based beams attached to a single layer of a material having a differing
3 coefficient of thermal expansion.

1 16. The method as defined in Claim 10, wherein said thermal actuators
2 include a silicon wafer, a sacrificial layer, a material with a first coefficient of thermal
3 expansion, and a material with a second coefficient of thermal expansion.

sub. a? 17. A thermally operated optical switch for use in directing a beam of
2 light to at least one receptor, said thermally operated optical switch comprising:
3 a plurality of reflective surfaces arrayed in a first position substantially
4 parallel to the beam of light; and
5 a plurality of energy sensitive flexible cantilever beams, each one of the
6 plurality of flexible cantilever beams being affixed to a corresponding one of said
7 plurality of reflective surfaces, wherein a selected energy sensitive flexible cantilever
8 beam is constructed and arranged to bend a selected one of the plurality of reflective
9 surfaces into a second position intersecting the light beam when connected to an energy
10 source, whereby when said selected reflective surface is in said second position the light
11 beam may be reflected to a receptor by the selected reflective surface which is caused to
12 bend by the selected energy sensitive flexible cantilever beam.

18. The thermally operated optical switch as defined in Claim 17,
2 wherein said selected energy sensitive flexible cantilever beam is frictionless.

19. The thermally operated optical switch as defined in Claim 17,
2 wherein said thermally operated optical switch is able to select the beam of light from
3 among a plurality of light beams by selecting the energy sensitive cantilever beam to
4 which energy is directed.

Jul 24 7
10. The thermally operated optical switch as defined in Claim 17
2 wherein said energy sensitive flexible cantilever beam is a silicon-based beam
3 sandwiched between two layers of a material having a differing coefficient of thermal
4 expansion.

Jul 24 7
11. The thermally operated optical switch as defined in Claim 17
2 wherein said energy sensitive flexible cantilever beam is a silicon-based beam attached to
3 a single layer of a material having a differing coefficient of thermal expansion.

Jul 24 7
12. The thermally operated optical switch as defined in Claim 17
2 wherein said energy sensitive flexible cantilever beam includes a silicon wafer, a
3 sacrificial layer, a material with a first coefficient of thermal expansion, and a material
4 with a second coefficient of thermal expansion.

Jul 24 7
13. The thermally operated switch as defined in Claim 17, wherein
2 said energy sensitive flexible backing includes a pair of substantially parallel dielectric
3 structural layers separated by an air layer, each of said substantially parallel dielectric
4 structural layers including a conducting layer.

1 24. The thermally operated switch as defined in Claim 17 wherein said
2 energy sensitive flexible beam includes a two substantially parallel cantilevered mounted
3 arms, each of said two substantially parallel cantilever mounted arms having a different
4 current density when connected to a source of electrical energy.

1 25. A thermally operated optical switch for use in directing at least one
2 incident beam of light to at least one receptor, said thermally operated optical switch
3 comprising:
4 a plurality of reflective surfaces arrayed in a first position substantially
5 perpendicular to an incident beam of light; and
6 a plurality of energy sensitive flexible cantilever beams, each one of the
7 plurality of flexible cantilever beams being affixed to a corresponding one of said
8 plurality of reflective surfaces, wherein a selected energy sensitive flexible cantilever
9 beam is constructed and arranged to move at least one of said reflective surfaces into a
10 second position intersecting said incident beam of light when connected to an energy
11 source, whereby when said at least one reflective surface is in said second position the at
12 least one incident beam of light is reflected to at least one receptor by the at least one
13 reflective surface which is caused to move from said first position to said second position
14 by the selected energy sensitive flexible cantilever beam.

1 26. The thermally operated optical switch as defined in Claim 25
2 wherein said energy sensitive flexible cantilever beams include a dielectric structural
3 layer either attached to one, or sandwiched between two conducting layers.

1 27. The thermally operated optical switch as defined in Claim 25
2 wherein said dielectric structural layer is made from a material selected from a group
3 including single or polycrystalline silicon, silicon dioxide, and silicon nitride.

1 28. The thermally operated switch as defined in Claim 25, wherein
2 said energy sensitive flexible cantilever beam includes a pair of substantially parallel
3 dielectric structural layers separated by an air layer, each of said substantially parallel
4 dielectric structural layers including a conducting layer.

1 29. The thermally operated switch as defined in Claim 25, wherein
2 said energy sensitive flexible cantilever beam includes a two substantially parallel
3 cantilevered mounted arms, each of said two substantially parallel cantilever mounted
4 arms characterized by having a different current density when connected to a source of
5 electrical energy.

1 30. The thermally operated switch as defined in Claim 25 wherein said
2 reflective surfaces are placed at substantially 45° to said incident beam of light.

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